

Educational Objectives for European Lighting Experts

Interior and Exterior Lighting

December 2025

Taxonomy

To pass the examination to become a European Lighting Expert in Interior or Exterior Lighting, memorized knowledge alone is not sufficient. The learning objectives must be achieved through individual intellectual effort in order to develop the required competence.

The learning objectives are therefore classified according to the level of competence to be attained.

The following three levels of difficulty are used for the examination:

C1: Knowledge

Reproduction of knowledge acquired by memorization or practice, such as enumerating, naming, describing, identifying, distinguishing, defining, and representing, as well as knowledge of connections, regularities, and applications.

C2: Comprehension

What has been learned is understood and can be explained, even in an unfamiliar context. This includes processing facts and problems, preferably supported by practical experience with calculations, graphic representations, and explanatory descriptions.

C3: Application

What has been learned must be applied in a new, previously unknown situation. Knowledge transfer takes place in a new application context: working on complex, multi-layered problems, such as those that can arise in everyday professional life, and finding the optimal solution from among various possibilities.

The difficulty increases from C1 to C3. The level required in a specific subject is indicated accordingly.

1. BASIC KNOWLEDGE			
1.1 Lighting Fundamentals		Interior	Exterior
1.1.1 Definition of Light			
	<i>Electromagnetic spectrum including the visible range</i>	C2	C2
	<i>Wave particle dualism</i>	C2	C2
1.1.2 Quantities and Units			
Photometric	<i>Luminous Flux Φ [Lumen]</i>	C3	C3
	<i>Luminous Intensity I [Candela]</i>	C3	C3
	<i>Luminance L [Candela per m²]</i>	C3	C3
Radiometric	<i>Spectral Power Distribution</i>	C3	C3
Colourimetric	<i>Correlated Colour Temperature T_{cp}</i>	C3	C3
	<i>CIE Colour Rendering Index R_a / CIE CRI</i>	C2	C2
Ratios	<i>Uniformity of illuminances</i>	C3	C3
	<i>Reflection factors</i>	C3	C3
	<i>Contrast</i>	C3	C3

1.1.3 Principles of Light Propagation			
	<i>Inverse Square Law</i>	C1	C1
	<i>Lambert's Cosine Law</i>	C1	C1
1.1.4 Colour			
	<i>Definition of Colour</i>	C1	C1
	<i>CIE Chromaticity Diagram</i>	C2	C2
	<i>Planckian Curve</i>	C2	C2
	<i>Additive and subtractive Colour Mixing</i>	C1	C1
1.1.5 Optic Characteristics of Materials			
	<i>Absorption</i>	C2	C2
	<i>Transmission</i>	C2	C2
	<i>Reflection</i>	C2	C2
	<i>Refraction</i>	C2	C2
1.1.6 Light and Human			
	<i>Visual perception</i>	C3	C3
Visual effects	<i>The human eye</i> - Eye sensitivity functions: scotopic, photopic and mesopic - Adaptation - Visual Acuity - Accommodation - Field of View - Colour vision - Contrast & Colour sensitivity	C1	C1
	<i>Visual (dis)comfort</i> - Disability and discomfort glare - Stroboscopic effect, SVM (Stroboscopic Visibility Measure) - Flicker, PstLM (short-term Light Modulation Indicator)	C1	C1
Non visual effects	<i>Physiological (health) effects, psychological effects, photobiological effects</i>	C1	C1
	<i>Acute and circadian effects</i>	C1	C1
Integrative Lighting /HCL	<i>Definition and application</i>	C3	C3
1.1.7 Light and Environment			
	<i>Influence on flora and fauna</i>	C1	C1
1.2 Electrical Engineering		Interior	Exterior
1.2.1 Electrical Fundamentals			
Electrical Safety	<i>Safety precautions (Fuses, (RCDs))</i>	C1	C1
	<i>Grounding, lightning protection (Search Protection Device)</i>	C1	C1
	<i>Safety categories (Protection Classes I, II, III)</i>	C1	C1
	<i>Basic protection (protection against direct contact) – from 131.2.1 in HD 60364-1</i>	C1	C1
	<i>Fault protection (protection against indirect contact) – from 131.2.2 in HD 60364-1</i>	C1	C1

1.3 Daylight		Interior	Exterior
1.3.1 Sun and Sky			
	<i>Sun position</i>	C1	-
	<i>Daylight availability</i>	C1	-
	<i>Sky models</i>	C1	-
1.3.2 Daylighting Design Considerations			
	<i>Daylight factor</i>	C2	-
	<i>Sun shading devices</i>	C2	-
	<i>Daylight systems</i>	C2	-
1.4 Lamps and Luminaires		Interior	Exterior
1.4.1 Light generation techniques			
	<i>Thermal radiation</i> - Incandescent lamps - Halogen lamps	C1	C1
	<i>Gas discharge</i> - Low and high pressure discharge lamps (e.g. fluorescence, sodium...)	C1	C1
	<i>Electroluminescence</i> - LEDs, OLEDs and their functionality	C1	C1
1.4.2 Solid state lamps			
LED	<i>Technology Development</i>	C1	C1
	<i>Characteristics (e.g. Spectrum and colour rendering, Lifetime)</i>	C2	C2
	<i>Light source replacement, Socket, e.g. Zhaga</i>	C1	C1
	<i>Performance Indicators: Binning, Mc Adams ellipse, Temperature behavior</i>	C2	C2
OLED		C1	C1
Drivers	<i>Drivers, Programming and CLO (Constant Lumen output)</i>	C2	C2
1.4.3 Luminaires			
Photometric properties	<i>Luminous intensity distribution</i>	C2	C2
	<i>Directionality classification</i>	C1	C1
	<i>Glare metrics,, e.g., UGR (for Interior Lighting), Glare Index (for Exterior Lighting)</i>	C2	C2
	<i>Components influencing photometric properties, e.g. Shades, Reflectors, Filters, Diffuser</i>	C2	C2
Mechanical properties	<i>Mounting constraints</i>	C1	C1
	<i>Safety classes (IPxx)</i>	C1	C1
	<i>Fire safety</i>	C1	C1
	<i>UV protection</i>	C1	C1
	<i>Explosion protection</i>	C1	C1
	<i>Ball sports protection</i>	C1	C1
	<i>Vandalism (Impact Protection rating (IK))</i>	C1	C1
Performance data	<i>Luminaire efficiency (luminous flux luminaire/luminous flux lightsource)</i>	C2	C2
	<i>Luminaire efficacy (lm/W)</i>	C2	C2
	<i>Thermal Management</i>	C2	C2
Documentation	<i>Required description on luminaire</i>	C1	C1
	<i>Test Marks/ ENEC, CE, national Test Marks, ...)</i>	C2	C2
Application	<i>Combination lamp and luminaire</i>	C1	C1

1.4.4 Lighting Control			
Types of Systems	<i>Open and closed loop control concepts</i>	C2	C2
	<i>Wired systems (Powerline, BUSnet, ...)</i>	C1	C1
	<i>Wireless systems (Mesh, Celular, ...)</i>	C1	C1
Communication Protocols	<i>Wired communication protocols (e.g., 0-10V DC, DALI, DMX, KNX)</i>	C3	C3
	<i>Wireless communication protocols (e.g., ZigBee, Z-Wave, Bluetooth, Wi-Fi)</i>	C2	C2
1.4.5 Life Cycle Analysis			
	<i>Recycling concepts (7 R-Model)</i>	C1	C1
	<i>Life cycle energy analysis (e.g., grey energy, sustainability, resources)</i>	C1	C1
	<i>Life cycle cost analysis (e.g., purchase costs, planning costs, installation costs, operating costs, conservation costs, maintenance costs, test costs, energy costs, cost development)</i>	C1	C1
1.5 Computer simulations			
	<i>Basic knowledge functionality (e.g., zonal cavity method, radiosity, raytracing)</i>	C1	C1
	<i>Applicable tools (e.g., DIALux, Relux)</i>	C3	C3
	<i>Design possibilities</i>	C3	C3
1.6 Project phases			
	<i>Basic evaluation</i>	C1	C1
	<i>Preliminary planning</i>	C1	C1
	<i>Design planning</i>	C1	C1
	<i>Approval planning</i>	C1	C1
	<i>Detailed design</i>	C1	C1
	<i>Preparation for award of contract</i>	C1	C1
	<i>Participation in awarding the contract</i>	C1	C1
	<i>Project supervision - construction supervision and documentation</i>	C1	C1
	<i>Project supervision</i>	C1	C1
1.7 Organizations and standards		Interior	Exterior
1.7.1 Organizations			
Lighting associations	<i>National associations</i>	C1	C1
	<i>International associations (e.g. CIE)</i>	C1	C1
Standardization bodies	<i>National standardization bodies (e.g., DIN, NEN)</i>	C1	C1
	<i>European standardization bodies (e.g., CEN)</i>	C1	C1
	<i>International standardization bodies (e.g., ISO)</i>	C1	C1

1.7.2 Standards / Recommendations			
National	<i>Relevant national regulations and recommendations</i>	C3	C3
European	<i>Lighting of workplaces (EN 12464-1, EN 12464-2)</i>	C3	
	<i>Road lighting (EN 13201)</i>	-	C3
	<i>Emergency lighting (EN 1838)</i>	C3	-
	<i>Central safety power supply systems (EN 50171:2022)</i>	C3	-
	<i>Daylighting recommendations (e.g., EN 17037)</i>	C3	-
	<i>Emergency escape lighting systems (EN 50172)</i>	C3	-
	<i>Automatic test systems for battery powered emergency escape lighting (EN 62034)</i>	C3	-
	<i>Particular requirements - Luminaires for emergency lighting (EN 60598-2-22)</i>	C3	-
	<i>Light and lighting - Sports lighting (EN 12193)</i>	C2	C2
	<i>Certification systems</i>	C3	C3
	<i>Environmental product declaration (EPD)</i>	C2	C2
	<i>Energy labelling</i>	C2	C2
	<i>Standards/ Recommendations for Measurements</i>	C2	C2
1.7.3 Technical reports			
	<i>Relevant CIE technical reports</i>	C1	C1

2. Photometric Measurements			
2.1 Fundamentals		Interior	Exterior
	<i>Photoelectric sensors</i>	C1	C1
	<i>Sensor performance</i>	C1	C1
	<i>Measuring instruments for practical use:</i> - <i>Illuminance meter</i> - <i>Spectrometer (showing colour values and illuminance)</i> - <i>Luminance meter / luminance camera</i> - <i>Other measuring devices (e.g. multimeter, thermometer)</i>	C1	C1
2.2 Measurements on Luminaires (Laboratory)		Interior	Exterior
	<i>Luminous intensity distribution</i>	C1	C1
	<i>Luminous flux measurement</i>	C1	C1
2.3 Lighting Measurements		Interior	Exterior
	- <i>Measurement grid</i> - <i>Measurement of illuminance & luminance</i> - <i>Measurements of Reflectances</i> - <i>Evaluation of Measurements</i>	C3	C3

3. INTERIOR LIGHTING		
3.1. Lighting Planning		Interior
3.1.1 Planning steps		
	<i>Space analysis (definition of task and activity areas)</i>	C3
	<i>Activity analysis (determination visual tasks executed in those areas)</i>	
	<i>Requirement analysis (selection of task – or activity related lighting requirements; e.g., maintained illuminance)</i>	
	<i>Conceptual design (decision of light distribution within the space)</i>	
	<i>- Modelling, shadows, Atmosphere</i>	
	<i>- Lighting Concept (direct/indirect)</i>	
	<i>- General lighting, task lighting (R. Kelly), workplace related lighting</i>	
	<i>Selection of luminaires and support systems</i>	
	<i>Maintenance factor and -plan</i>	
	<i>Validation through calculations</i>	
	<i>Analysis of costs, energy, nature and environment</i>	
	<i>Technical feasibility and execution planning</i>	
3.1.2 Monitoring during construction		
	<i>Plan review, changes</i>	C2
	<i>- Space impression</i>	
	<i>- Activities in the space</i>	
	<i>- Photometric qualitative properties</i>	
	<i>- Building perspectives</i>	
	<i>- Types of luminaires</i>	
	<i>- Transition point to other installations</i>	
3.1.3 Documentation of lighting installation		
	<i>- Planning documents</i>	C3
	<i>- Economic considerations</i>	
	<i>- Lighting calculations</i>	
	<i>- Maintenance plan</i>	
	<i>- Luminaire documentation</i>	
	<i>- Verification results (e.g., measurements (see Chapter 4))</i>	
3.1.4 Renovation Aspects		
	<i>Description of current situation:</i>	C3
	<i>- Existing lighting systems (e.g., ergonomics, control, technical reliability)</i>	
	<i>- Analysis of advantages</i>	
	<i>- Potential (Energy Saving)</i>	
	<i>- Profitability</i>	
3.2 Execution and operation of interior lighting		Interior
3.2.1 Commissioning		
	<i>Commissioning and calibration of controllers and sensors</i>	C3
3.2.2 Verification		
	<i>Electrical test</i>	C2
	<i>Photometric test</i>	C2

3.2.3 Post occupancy evaluation		
	<i>Check if requirements are met</i>	C3
3.3 Lighting Applications		Interior
3.3.1 Workplaces Indoor (exemplary applications)		
	<i>e.g. Offices, Industry Halls, Factories, Schools, ...</i>	C3
3.3.2 Emergency Lighting		
	<i>Types of emergency lighting (Replacement lighting, Safety lighting for escape routes, Anti-panic lighting, Safety lighting for workplaces with particular hazards)</i>	C2
	<i>Emergency lighting systems, Batteries</i>	C1
	<i>Safety and escape signs</i>	C2
	<i>Lighting planning and cooperation with (local) fire insurance companies and authorities</i>	C3

4. Exterior Lighting		
4.1. Lighting Planning		Exterior
4.1.1 Planning steps		
	<i>Area analysis (definition of task and activity areas)</i>	C3
	<i>Activity analysis (determination visual tasks executed in those areas)</i>	
	<i>Requirement analysis (selection of task - or activity related lighting requirements; e.g., maintained illuminance)</i>	
	<i>Conceptual design (decision of light distribution within the area)</i>	
	<i>- Determination of lighting concept</i>	
	<i>- Lighting design basics (general / task / workplace)</i>	
	<i>- Lighting management plan</i>	
	<i>Selection of luminaires and support systems</i>	
	<i>Maintenance factor and -plan</i>	
	<i>Validation through calculations</i>	
	<i>Analysis of costs and energy</i>	
	<i>Analysis of nature and environment</i>	
	<i>Technical feasibility and execution planning</i>	
	<i>Lightning protection and transient voltages</i>	
4.1.2 Monitoring during construction		
	<i>Plan review, changes</i>	C2
	<i>- Area impression</i>	
	<i>- Activities in the area</i>	
	<i>- Photometric qualitative properties</i>	
	<i>- Building perspectives</i>	
	<i>- Types of luminaires</i>	
	<i>- Transition point to other installations</i>	
4.1.3 Documentation of lighting installation		
	<i>- Planning documents</i>	C3
	<i>- Economic considerations</i>	
	<i>- Lighting calculations</i>	
	<i>- Maintenance plan</i>	
	<i>- Luminaire documentation</i>	
	<i>- Verification results (e.g., measurements see Chapter 4)</i>	

4.1.4 Renovation Aspects		
	<i>Description of current situation:</i>	C2
	- <i>Existing lighting systems (e.g., ergonomics, control, technical reliability)</i>	C2
	- <i>Electrical dangers in outdated installations</i>	C1
	- <i>Analysis of advantages</i>	C2
	- <i>Potential (Energy saving)</i>	C2
	- <i>Profitability</i>	C2
	- <i>Environment</i>	C2
4.2 Execution and operation of exterior lighting		Exterior
4.2.1 Commissioning		
	<i>Commissioning and calibration of controllers and sensors</i>	C2
4.2.2 Verification		
	<i>Electrical test</i>	C1
	<i>Photometric test</i>	C3
4.2.3 Post occupancy evaluation		
	<i>Check if requirements are met</i>	C3
4.3 Lighting Applications		Exterior
4.3.1 Workplaces outdoor (exemplary applications)		
	<i>e.g. Lighting for areas, tasks and activities</i>	C3
4.3.2 Street Lighting		
	<i>Street Lighting</i>	C3
	<i>Area Lighting (Streetsparkings, squares, parks)</i>	C3
	<i>Underpasses and short tunnels</i>	C3
	<i>Urban design</i>	C2
4.3.3 Other applications		
	<i>e.g. Tunnel lighting, Illumination, Outdoor sports lighting</i>	C1